

Application No. 10/009,937

AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough for six or more characters and double brackets for five or less characters; and 2. added matter is shown by underlining.

1.-14. (Cancelled)

15. (Currently Amended) The method as described in Claim 43 [[13]], wherein in the step of measuring the transmitted light intensity for the plurality of light incident angles, monochromatic light is incident from the light incident side.

16.-39 (Cancelled)

40. (New) A method for detecting a pretilt angle of an element in which the direction of orientation of molecules is twisted from a light incident side to light outgoing side, the method comprising:

measuring transmitted light intensity of light from the light incident side for a plurality of light incident angles by rotating the element about an axis perpendicular to the direction of transmitted light towards the element;

Application No. 10/009,937

analyzing dependence of the measured transmitted light intensity for the plurality of light incident angles wherein an apparent retardation for the plurality of light incident angles is determined based upon the measured transmitted light intensity for the plurality of light incident angle wherein the pretilt angle of the element is determined based upon the determined apparent retardation for the plurality of light incident angles; and

determining the pretilt angle of the element based upon the analysis results wherein an average tilt angle is determined based upon the determined apparent retardation for the plurality of light incident angles, and the pretilt angle is determined based upon the determined average tilt angle.

41. (New) A method for detecting a pretilt angle of an element in which the direction of orientation of molecules is twisted from a light incident side to light outgoing side, the method comprising:

measuring transmitted light intensity of light from the light incident side for a plurality of light incident angles by rotating the element about an axis perpendicular to the direction of transmitted light towards the element wherein the transmitted light intensity is measured in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan \alpha^{in} = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}$$

Application No. 10/009,937

analyzing dependence of the measured transmitted light intensity for the plurality of light incident angles wherein an apparent retardation for the plurality of light incident angles is determined based upon the measured transmitted light intensity for the plurality of light incident angles; and

determining the pretilt angle of the element based upon the analysis results wherein the pretilt angle of the element is determined based upon the determined apparent retardation for the plurality of light incident angles.

42. (New) A method for detecting a pretilt angle of an element in which the direction of orientation of molecules is twisted from a light incident side to light outgoing side, the method comprising:

measuring transmitted light intensity of light from the light incident side for a plurality of light incident angles by rotating the element about an axis perpendicular to the direction of transmitted light towards the element, wherein the transmitted light intensity is measured in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan\alpha^{in} = - \frac{\Phi - \sin\Phi}{1 - \cos\Phi}$$

analyzing dependence of the measured transmitted light intensity for the plurality of light incident angles, wherein Stokes parameters for the plurality of light incident angles are determined based upon the measured transmitted light intensity for the plurality of light incident

Application No. 10/009,937

angles, wherein the pretilt angle of the element is determined based upon the determined Stokes parameters for the plurality of light incident angles; and
determining the pretilt angle of the element based upon the analysis results.

43. (New) A method for detecting a pretilt angle of an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, the method comprising:

measuring transmitted light intensity of light from the light incident side for a plurality of light incident angles by rotating the element about an axis perpendicular to the direction of transmitted light towards the element and at a plurality of optical element arrangements for each light incident angle;

analyzing dependence of the measured transmitted light intensity for the plurality of light incident angles wherein wherein Stokes parameters for the plurality of light incident angles are determined based upon the measured transmitted light intensity for the plurality of light incident angles, and wherein the pretilt angle of the element is determined based upon the determined Stokes parameters for the plurality of light incident angles; and

determining the pretilt angle of the element based upon the analysis results wherein, an apparent retardation for the plurality of light incident angles is determined based upon the determined Stokes parameters for the plurality of light incident angles, and the pretilt angle of the element is determined based upon the determined apparent retardation for the plurality of light incident angles and wherein, an average tilt angle is determined based upon the determined retardation for the plurality of light incident angles, and the pretilt angle is determined based upon the determined average tilt angle .

Application No. 10/009,937

44. (New) A method for detecting a pretilt angel of an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, the method comprising:

measuring transmitted light intensity of light from the light incident side for a plurality of light incident angles by rotating the element about an axis perpendicular to the direction of transmitted light towards the element and at a plurality of optical element arrangements for each light incident angle wherein the transmitted light intensity is measured in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan \alpha^{in} = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}$$

analyzing dependence of the measured transmitted light intensity for the plurality of light incident angles wherein Stokes parameters for the plurality of light incident angles are determined based upon the measured transmitted light intensity for the plurality of light incident angles; and

determining the pretilt angle of the element based upon the analysis results wherein, an apparent retardation for the plurality of light incident angles is determined based upon the determined Stokes parameters for the plurality of light incident angles, and the pretilt angle of the element is determined based upon the determined apparent retardation for the plurality of light incident angles.

Application No. 10/009,937

45. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector;

wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and detects the pretilt angle of the element based upon the analysis;

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

wherein the processing device detects an apparent retardation for the plurality of light incident angles based upon the transmitted light intensities output from the photodetector and detects the pretilt angle of the element based upon the determined apparent retardation for the plurality of light incident angles; and

wherein the processing device determines the average tilt angle based upon the determined apparent retardation for the plurality of light incident angles and determines the pretilt angle based upon the determined average tilt angle.

Application No. 10/009,937

46. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector, wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and detects the pretilt angle of the element based upon the analysis

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

wherein the processing device detects an apparent retardation for the plurality of light incident angles based upon the transmitted light intensities output from the photodetector and detects the pretilt angle of the element based upon the determined apparent retardation for the plurality of light incident angles; and

wherein the pretilt angle is determined based upon the transmitted light intensity in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

Application No. 10/009,937

$$\tan \alpha^m = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}$$

47. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector;

wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and detects the pretilt angle of the element based upon the analysis;

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and the processing device determines the pretilt angle of the element based upon the analysis results;

wherein the processing device calculates Stokes parameters for the plurality of light incident angles based upon the transmitted light intensity output from the photodetector and determines the pretilt angle of the element based upon the determined Stokes parameters for the plurality of light incident angles; and

Application No. 10/009,937

wherein the processing device determines the average tilt angle based upon the determined apparent retardation for the plurality of light incident angles and determines the pretilt angle based upon the determined average tilt angle.

48. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector, wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and the processing device determines the pretilt angle of the element based upon the analysis

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

wherein the processing device calculates Stokes parameters for the plurality of light incident angles based upon the transmitted light intensity output from the photodetector and determines the pretilt angle of the element based upon the determined Stokes parameters for the plurality of light incident angles; and

Application No. 10/009,937

wherein the pretilt angle is determined based upon the transmitted light intensity in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan \alpha^{\text{in}} = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}.$$

49. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and the processing device determines the pretilt angle of the element based upon the analysis;

wherein a quarter-wave plate is provided between the element and the analyzer;

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

Application No. 10/009,937

wherein the processing device detects an apparent retardation for the plurality of light incident angles based upon the transmitted light intensities output from the photodetector and detects the pretilt angle of the element based upon the determined apparent retardation for the plurality of light incident angles; and

wherein the processing device determines the average tilt angle based upon the determined apparent retardation for the plurality of light incident angles and determines the pretilt angle based upon the determined average tilt angle.

50. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector, wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and the processing device determines the pretilt angle of the element based upon the analysis;

wherein a quarter-wave plate is provided between the element and the analyzer;

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

Application No. 10/009,937

wherein the processing device detects an apparent retardation for the plurality of light incident angles based upon the transmitted light intensities output from the photodetector and detects the pretilt angle of the element based upon the determined apparent retardation for the plurality of light incident angles; and

wherein the pretilt angle is determined based upon the transmitted light intensity in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan \alpha^{in} = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}$$

51. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector, wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and the processing device determines the pretilt angle of the element based upon the analysis; wherein a quarter-wave plate is provided between the element and the analyzer;

Application No. 10/009,937

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

wherein the processing device calculates Stokes parameters for the plurality of light incident angles based upon the transmitted light intensity output from the photodetector and determines the pretilt angle of the element based upon the determined Stokes parameters for the plurality of light incident angles; and

wherein the processing device determines the average tilt angle based upon the determined apparent retardation for the plurality of light incident angles and determines the pretilt angle based upon the determined average tilt angle.

52. (New) An apparatus for detecting a pretilt angle arranged in the following sequence: a light source, a polarizer, an element in which the direction of orientation of molecules is twisted from a light incident side to a light outgoing side, an analyzer, and a photodetector, wherein the apparatus also comprises a processing device for processing output signals from the photodetector, the processing device analyzes the dependence of transmitted light intensity on a light incident angle based upon the transmitted light intensities for a plurality of light incident angles that were output from the photodetector, wherein a plurality of light incident angles are determined by rotating the element about an axis perpendicular to the direction of light from the light source, in which light is transmitted in the direction towards the element, and the processing device determines the pretilt angle of the element based upon the analysis;

wherein a quarter-wave plate is provided between the element and the analyzer;

Application No. 10/009,937

wherein the processing device analyzes the dependence of the transmitted light intensity on the light incident angle based upon the transmitted light intensities for a plurality of optical element arrangements for each of the plurality of light incident angles that was output from the photodetector, and detects the pretilt angle of the element based upon the analysis results;

wherein the processing device calculates Stokes parameters for the plurality of light incident angles based upon the transmitted light intensity output from the photodetector and determines the pretilt angle of the element based upon the determined Stokes parameters for the plurality of light incident angles; and

wherein the pretilt angle is determined based upon the transmitted light intensity in a state in which the following relationship is valid between the orientation direction α^{in} (rad) of molecules at the light incident side interface of the element and the twist angle Φ (rad) of the element:

$$\tan \alpha^{in} = - \frac{\Phi - \sin \Phi}{1 - \cos \Phi}.$$